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THE CLOVER ROOT CURCULIO

CIRCULAR NO. 42

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Left—Alfalfa plants of the same age, the smaller injured in the seedling stage, by adult beetles. Uninjured plants 14 inches long; injured plants 6 inches long. Right—Alfalfa root showing injury by larvae of the clover root curculio. Half natural size.

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The Clover Root Curculio

By H. H. JEWETT

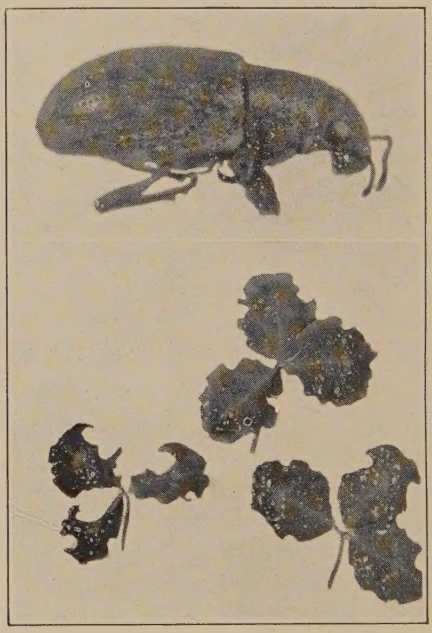
The clover root curculio, *Sitona hispidula,* is of foreign origin. It was found in America in 1876, and has now become widely distributed in the United States. The first account of importance dealing with this insect was published in 1910 by V. L. Wildermuth (1). This account had to do mainly with the life history and habits and damage by the insect. F. M. Webster (2), in 1915, published a review of the work by Wildermuth with some additional records. J. H. Bigger (3), in 1930, published some notes on the life history and damage by the insect.

The clover root curculio is present every year in clover and alfalfa fields and is capable of doing considerable damage. Because of the difficulty of getting and maintaining good stands of clover and alfalfa in certain localities, it was believed this insect might be a factor of considerable importance. Accordingly, a study was begun in the spring of 1932 for the purpose of observing the extent of the insect's injury and the effect on clover and alfalfa.

CHARACTER AND EXTENT OF INJURY

The injury to clover and alfalfa by the adults consists in the eating of rounded, irregular patches from the margins of the leaves and gnawing the stems and leaf buds of young seedlings. The injury to young seedlings may cause their death or weaken them to such extent that they make much less growth than when uninjured. The injury to older plants does not seem important except when the beetles are numerous.

The injury by the larvæ consists in the destruction of fine rootlets and nodules, and gnawing out portions of the main root. The feeding on the roots may effect a partial girdling and form long furrows. The wounds produced by feeding may furnish places of entrance for disease organisms. An examination in



Above—Adult clover root curculio, magnified about 10 times. Below—Leaves of red clover injured by the adult beetle. About half natural size.

September, 1932, of roots of clover and alfalfa plants that were two years old, showed curculio injury on 71 percent of the clover roots and 65 percent of the alfalfa roots.

THE STAGES OF THE INSECT

Adult. The adult clover root curculio is a small weevil 3 to 5 mm. long and about 2 mm. wide. The general body color is black, sometimes shading to dark brown. The upper surface is covered with red, brownish or grayish scales. Those on the thorax are arranged to form a rather indistinct median, and two

lateral lines or stripes. The beak is short, curved, and thick. A technical description is given by Blatchley and Leng (4).

Egg. The egg is slightly elipsoidal, almost spherical, and about .36 mm. in diameter. It is white or slightly yellow when first laid, but turns black after a day or two.

Larva. The larva is a small, fleshy grub about 5 mm. long and 1.3 mm. wide when full-grown. The head is light brown and the body tapers slightly toward the posterior end.

Pupa. The pupa is white or slightly yellow and about 4 mm. long. The abdomen tapers gradually to the posterior end, and there is a dark colored spine at each side of the terminal segment. The eyes and beak become brown after the pupa is a few days old.

SEASONAL HISTORY

The adults become active during the first warm days in spring. They begin laying eggs in March and continue to lay thru the first week of June. In 1932 and 1933, the latest date on which eggs were laid by adults that lived over winter was June 11. Adults that live over winter die off rapidly during the first part of May, but some have been kept in cages till June 20. The adults of the summer brood remain inactive during the hot weather at mid-season, but become active in the fall, when they mate and may lay eggs from about the middle of October thru November.

The eggs are laid on the leaves and stems near the soil or on the soil or trash around the plants.

Eggs laid in the spring hatch in about two weeks, but those laid in the fall (3) hatch the following spring. The young larvæ, upon hatching, move down into the soil to feed on the roots. The adults appear in about 40 to 45 days after the eggs are laid, except when the eggs are laid in the fall. There is only one generation of the insect a year. The beetle hibernates both in the adult and egg stages. Adults were found hibernating under trash or remnants of the plants in the field.

EXPERIMENTS WITH THE CLOVER ROOT CURCULIO

Method of Procedure. In order to determine the effect of the feeding of adults and larvæ upon clover and alfalfa, a num-

ber of experiments were made in the insectary and field. In the insectary adults were confined upon seedling plants for different numbers of days and the amount of injury and the subsequent growth of the plants were observed. Uninfested plants were kept for comparison. In the field, beetles were collected and confined in cages upon clover and alfalfa. Each cage enclosed clover or alfalfa in rows ten feet long, and for each experiment there was one plot of infested and one of uninfested plants. Plants from both fall- and spring-sown seed were used in these experiments.

Very young red clover seedlings. Those at the right show injury by adult beetles.

Results. The results of the experiments in the insectary are summarized in Tables 1 and 2. The growth of infested seedlings was less in every instance than that of uninfested seedlings. The injury to very young seedlings was more severe than to older seedlings and fewer young seedlings survived. One beetle could destroy one or more very young seedlings.

The results of the experiments in the field are summarized in Tables 3 and 4. There was very little difference in reduction in yield of plants from spring- and fall-sown seed, but reduction in yield of clover was slightly less than that of alfalfa. The reduction in yields of alfalfa that had been infested for two seasons was considerable, the largest being 18.6 percent and the smallest 10 percent.

TABLE 1. Effect of the feeding of the clover root curculio on clover seedlings, 1932. Tests in the insectary.

Clover Seedlings		Beetles on Seedlings		Final Examination				
Number	Height, Inches	Number	Time	Date	Height, Inches		Survived, Percent	
					Infested	Check	Infested	Check
24	0.5	16	May 12–20	June 28	9.0	12.0	25.0	100
24	0.5	11	May 16–22	June 28	3.0	6.5	66.6	100
14	0.5	12	May 16–21	June 28	4.7	6.5	71.4	100
18	0.5	12	June 7–11	June 30	4.0	6.0	82.2	100
25	1.0	16	May 20–24	July 5	10.0	12.0	80.0	99.3
24	1.0	9	May 21–24	July 5	9.0	12.0	87.5	100
22	1.5	30	May 26–28	July 5	9.0	12.0	99.9	100
25	1.5	30	May 24–26	July 11	12.0	14.0	88.0	100
23	2.0	22	May 28–30	July 11	11.0	14.0	86.9	95.6
20	2.0	22	May 30–June 3	July 11	12.0	14.5	90.0	100

TABLE 2. Effect of the feeding of the clover root curculio on alfalfa seedlings, 1932. Tests in the insectary.

Alfalfa Seedlings		Beetles on Seedlings		Final Examination				
Number	Height, Inches	Number	Time	Date	Weight, Grams		Survived, Percent	
					Infested	Check	Infested	Check
11	0.5	11	April 4–7	June 25	15	32	72.7	100
15	0.5	15	April 12–17	June 21	29.8	54.9	93.4	100
18	0.5	29	April 22–27	June 21	21.6	35.2	16.6	100
20	0.5	20	May 20–31	June 30	00	50.5	00	100
7	1.0	15	April 15–17	June 21	11.5	38.2	42.9	100
21	1.0	25	May 4–9	June 30	4.0	18.0	47.6	95.2
19	1.5	21	May 9–13	June 30	7.0	25.0	73.2	100
1	4.0	14	May 27–June 6	July 5	17.5	18.0	100	100
10	4.5	30	April 27–22	June 21	18.5	80.5	100	100
1	5.0	9	June 6–20	July 5	17.0	20.0	100	100

TABLE 3. Effect of clover root curculio injury on plants from spring- and fall-sown seed.

Date Sown	Date Cut	Height When Cut, Inches		Weight When Dried Grams		Reduction in Season's Yield
		Infested	Check	Infested	Check	Percent
Alfalfa Spring 1932	June 30 Aug. 4	32 26	36 28	370 360	420 375	8.2
Clover Spring 1932	June 24 July 28	28 20	32 24	880 290	1,035 330	14.3
Alfalfa Fall 1932	July 20 Sept. 7	24 28	30 28	160 130	170 150	9.4
Clover Fall 1932	July 20 Sept. 7	20 20	24 28	205 220	230 250	11.5

TABLE 4. Effect of clover root curculio injury on alfalfa plants infested two seasons, 1933.

Date Cut	Height When Cut, Inches		Weight When Dried, Grams		Reduction in Season's Yield
	Infested	Check	Infested	Check	Percent
June 5	24	24	470	680	
July 20	30	32	635	665	18.6
Sept. 7	26	28	275	350	
June 5	22	24	210	250	
July 20	30	30	235	260	10.0
Sept. 7	28	30	230	240	
June 5	20	22	460	500	
July 11	24	30	280	405	17.7
Sept. 7	10	18	145	170	

SUMMARY

Laboratory and field experiments show that the clover root curculio is capable of doing a great deal of damage to clover and alfalfa. Young seedlings are especially susceptible to injury.

Yields of alfalfa from plants infested for two seasons, were reduced as much as 18.6 percent. There was very little difference in reduction of yield of plants from spring-sown and fall-sown seed.

During the seasons of 1932 and 1933, the beetles were not found in the field in large enough numbers to cause any serious damage to clover and alfalfa.

The insect at present should be recognized as a potential pest with possibilities for doing a great deal of damage under conditions that permit any great increase in numbers.

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